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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Comparison of UV irradiances from Aura/Ozone Monitoring Instrument (OMI) with Brewer measurements at El Arenosillo (Spain) – Part 2: Analysis of site aerosol influence" *by* V. E. Cachorro et al.

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Items-by-items response to Reviewer #2

(* Reviewer comment, ++ Our response)

General comment

* The correction of the English grammar as well as a revision of the English is urgently needed all over the text. Some sentences are not all understandable from the English point of view therefore a revision by an English expert is needed.

++ As derived from the reviewer comments (also he did not make reference to the numeration lines according to ACPD) we think that the reviewer revised the first version of the manuscript before the technical changes and those suggested by the Editor to be accepted for ACP Discussion. In this way the first suggestion for abstract has not sense (this was removed) and also those related to the improvements of the English language. Anyway we ask for this aspect to the Editor.

Abstract

* Besides the English corrections, please explain what is mean by AOD features, inserted in a sentence, between brackets, in the 3rd paragraph, after ". . ..SSA value of 0.915..".

++ We do not understand this requirement because the sentence (AOD features) was removed of the first version, according to the demanded technical modifications previous to appear in the version of the web of ACPD.

* Why the relative reductions of the OMI irradiances by the application of both approaches (8,4% and 11.6%) are not presented also in the Conclusions? It should be written that these relative reductions are average values.

++ According to the reviewer's suggestion, the relative reductions of OMI irradiancies (8.4% and 11.6%) have been specifically added to conclusions. Introduction * The specification of the wavelength in the AOD values is needed. AOD(440) > or< ???? instead of AOD> or<????

++ The first suggestions about AOD(440nm) have been done in the text. Otherwise it is well specified in the context of the sentences at what wavelength we are referring when speaking about AOD, AAOD and SSA.

* Please indicate a reference or the criteria used to set up the thresholds of 0.25, above which is considered moderate-high aerosol load, or the thresholds of 0.1, below which is considered low aerosol load.



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++ The reference of Antón et al. (2010) is now given. Inside the text we also refer to Toledano et al. (2007a) to justify the selected criteria based on previous works. Nevertheless, the reviewer must realise that we are analysing the data and we demonstrate by the figures why we take these criteria and limits for the data.

Site, instruments and data.

* The paragraph starting with the description of the site (3rd paragraph) should come after the 1st paragraph, before the sentence starting with "Aerosols were characterized. . .. . .".

++ The second paragraph has been removed because it is unnecessary "Aerosols were characterized by information provided by a CIMEL sun-photometer belonging to AERONET (Toledano et al., 2007a) and UV irradiances were measured by Brewer MK-III double monochromator spectrophotometer #150".

* Please specify the AERONET data quality level (1.5, 2????) used in this study.

++ In this study we have used different AERONET levels depending on the parameter: AOD, alpha, SSA, AAOD, therefore we have specified in the text when necessary. Also it is showed SSA values of other stations and we specify the quality level taken.

* Page 6, when mentioning that daily OMI data is used, please specify the meaning of daily: average of how many overpasses?

++ The expression "daily OMI data" means that OMI data for each day are derived from the satellite overpass closest to the ground-based location. In order to clarify this subject, we have replaced the sentence "In this work, we used daily OMI data recorded closest to the ground-based location" by the following: "In this work, the daily OMI data are derived from the satellite overpass closest to the ground-based location"

* Since the distance between the centre of the satellite pixel and the station vary from 0.1 up to 48 km and an average value of 11.5 was considered, please specify the standard deviation



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++ According the reviewer's suggestion, we have specified in the text the standard deviation (8.1 km).

Methodology

* Page 7, 2nd paragraph after equation 4, specify the wavelengths of AOD greater than 0.4.

++ AOD greater than 0.4 always refers to 440 nm and this is added in the entire text as required.

* Page 8, three approaches for selecting the absorbing aerosols were used and not only the two based on SSA or AAOT? The justification to use the three approaches is short.

++ We do not understand this question or requirement. The reviewer refers to how we can justify the choice of AOD-alfa, SSA or AI to define the absorbing properties of aerosols. In the text we take from pages 16395-16402 to analyse, demonstrate or justify how works these magnitudes to represent the absorbing aerosol properties. The reviewer refers to the two approaches of SSA constant, variable or the third given by the b=3 of Krotkov?. We think that in this sense we do not need make any large justification because this is the current "state of the art" in this research, otherwise we can do other very different approaches, not necessarily related with absorbing aerosols.

Absorbing aerosol determination based on AOD-alpha and AI information

* Page 9 – Specify what is the meaning of "both branches are joined" for AOT(440 nm) values lower that 0.25.

++ We think that the meaning of Figure 1b is clear. The points are join for AOD(440 nm) values lower than 0.25. After that the points separate and divided in two different lines or branches. This is the normal behaviour when two different size types of aerosols exist in the aerosol particle size distribution.



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* Why is it expected that the two groups of aerosols identified in Fig 2b may represent absorbing aerosol. In what spectral range?

++ We suppose that this question is part of the previous question. A priori we do not expect that these two identified groups will be or not absorbing aerosols. What we try to do is to apply a method to try to identify the existing type of aerosols, and this is the simplest way to gain information. Otherwise, taking into account the rural and coastal characteristics of our site, high AOD(440 nm) values (separate points in the two branches) are necessary identified with polluted aerosols (which are not clean aerosol), then a priori they have more possibilities to be absorbing. As we demonstrate later, this is not occurs. The question "in what spectral range" has not sense here, in this context of the discussion.

* Page 10. Please note the value of R2 = 0.17 is not the value indicated in Figure 3a (R2 = 0.16).

++ Thanks, we correct it in the text.

* Page 10 and 11. I don't see much difference between the findings in Figures 3b and 4, in terms of BB aerosols: they are only identified when A>0.5, in the 2 quadrant like in Fig. 4.

++ Yes, but the BB aerosols may be easily identified one time we have made the figures 3 a,b and 4 (Figure 4 is to fix the identification in term of aerosol studies because obviously the ratio OMI/brewer has not sense). However, the important in figure 3b and 4 is not only the finding of BB, but that of the other aerosol types. We expected that aerosol represented by red in Figure 3b would be more absorbing (which a priori if we do not mark with red colour we can not identify in Figure 3b) and only BB appears clearly as absorbing. All these figures try to identify the aerosols types and see if the information of all of them is congruent.

* Page 11- Please explain the meaning of sentence "...and not very sensitive to the



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aerosol boundary layer" in the last paragraph.

++ We put this observation to emphasize that AI has a poor sensitivity to aerosol in the troposphere or aerosols in the low layers of the troposphere, hence to boundary layer aerosols. Therefore, it is not an adequate parameter for normal conditions of work in El Arenosillo. Only under strong desert dust intrusions or other strong effect as biomass burning, AI is a good indicator. We have modified the original sentence by the following: ". . .AOD and SSA are the same, hence not very sensitive to the presence of aerosols in the boundary layer or low layers in the troposphere".

Absorbing aerosol based on SSA values and its relation with AOD, alpha and AI.

* In the first sentence of the first paragraph specify the AOD-alpha conditions of the selected two groups of aerosols of high AOD with potential absorbing properties.

++ According the reviewer's suggestion, the new sentence is now: "Two groups of high AOD(440 nm) with potential absorbing properties have been selected, with alpha lower and greater than 0.82"

* 2nd paragraph – It would be better to give information about the number of cases that were eliminated due to the restriction of AOD(440)$\geq$0.4.

++ No, because we explain the general conditions for all the stations of AERONET and not only for our station. For the period here analysed and for our station the number of available data of SSA for AOD(440nm)> 0.4 is 14 for level 1.5 and 6 for level 2, then it is clear that we can not work under these numbers of data. Also in the text of the article we always refers to the number of data we have. Furthermore the other reviewer asks us for more explanations in this part.

* 3th paragraph- What is the dimension of the AERONET level 2 used in this study?.

++ As it is clearly said in the text we work with level 1.5 for SSA and derived AAOD, not level 2. In all the text we indicate the number of points with which we are working, which is not indicated in other papers. Furthermore, in order to give an idea of the



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problem we have with SSA data, we explain to the reader that taken 9 years of data we can not make a reliable climatology and we show the results of SSA data for other relevant sites. Here we considered only data for OMI comparison from 2004-2008 and hence the number of available data of day SSA values is indicated in Table 2 and the number of points reduce to 6 for level 2.

Application of corrections for OMI bias. Approaches of SSA constant and SSA variable.

* Please note that in Figure 7 the SSA value is of 0.916 and not of 0.915 as in the text
* Last paragraph, 1st sentence of this section instead of Figure 4a it should be Figure 3a

++ Thanks. We have corrected this minor error in the text.

Conclusion

* The same relative reductions of OMI irradiances by the application of both approaches (8,4% and 11.6%) should be also presented in this Section, besides of being in the Abstract.

++ We put 5 instead of 4 for conclusion (thanks again) and also we have added this last recommendation.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16385, 2010.